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Uniformity in the Division of the Abdominal Regions.

PAPERS BY

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WITH THE DISCUSSION.

*Reprinted from the Boston Medical and Surgical Journal
of July 6, 1893.*

BOSTON:

DAMRELL & UPHAM, PUBLISHERS,

283 WASHINGTON STREET.

1893.

S. J. PARKHILL & CO., PRINTERS
BOSTON

THE NEED OF AGREEMENT ON THE LIMITS OF THE ABDOMINAL REGIONS, AND A PROPOSITION FOR A NEW METHOD OF DIVISION.¹

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THE surface of the abdomen, as viewed from the front, is very extensive, and presents in the normal condition few features which are at once obvious and constant. Indeed, the only one which is invariable is the navel. The depression called *scrobiculus cordis* is often lacking; the exact line of the groin must sometimes be searched for with care; the capillary embellishment of the pubes is absent in childhood; the *linea alba*, the *lineæ semilunaris*, and the sloping margin of the thorax are frequently obscured by corpulence. The umbilicus alone, while varying in size and depth, is always present. The need, therefore, of some artificial markings to aid in the localization of parts or objects upon, within, or behind the parietes must have been felt by the early students of anatomy. Just at what period any such drawing of lines of latitude and longitude as at present obtains was begun, I am unable to declare, my opportunities for investigating this mat-

¹ Read before the Association of American Anatomists at Princeton, N. J., December, 1892.

Last spring, during my annual course of lectures in the Medical Department, Bowdoin College, I told the class of my purpose to read this paper, for which the materials were then substantially collected, at this meeting of the Association. I had never seen or heard of a proposition looking towards agreement on the boundaries of the abdominal regions; and my first knowledge of any such was received after I had forwarded the title of this essay to our Secretary, who immediately kindly informed me of the intention of one of our colleagues to write on the same subject, and sent me a copy of the paper of Professor Anderson. I have, however, not read a line of the latter, in order to be absolutely free from the imputation of plagiarism.

ter having been too limited to determine the point. It is sufficient for my purpose, as a practical anatomist, to know that such a method has been in vogue for more than a century, and that its universal adoption is evidence of the recognition of its value. Nobody now would wish to be deprived of the terms of convenience which this plan has fastened upon our nomenclature ; but doubtless everybody who studies the subject would be glad to have these terms made so definite that there would be no room for doubt as to the exact meaning and the limits of application of each of them. It must be acknowledged, though the confession is not creditable to the scientific pretensions of anatomy, that there is a grievous lack of uniformity in the method of drawing the lines by which the anterior abdominal wall is mapped out into regions.

Having been for a long time annoyed on this account, I have had the curiosity to make a careful examination of the statements of the writers of the works most easily accessible to me, who make any mention of the matter. Though it is quite possible that search through a larger collection would reveal a still greater number of variations on the simple theme, the dozen which I am about to quote abundantly sustain the thought which I have made the title of this essay ; and I have, therefore, forborne to make so unnecessary, and hence unwarrantable, a tax upon your patience as more extensive quotation would involve. One does not have to eat a whole cheese to get its flavor.

Before proceeding to a detailed presentation of the facts, it is well to place clearly before us the purpose in view in the creation of these artificial areas. This is so well stated in Quain and Wilson (Pancoast's edition, 1842) that I quote their words :

"The larger or upper compartment of the abdomen is subjected to what may be called a technical subdivision into regions ; not that there are any septa or

partitions between them, but because of the many important parts which are contained in it, and which require to be minutely described.

“It must be obvious that the very purpose and intent of marking out these lines show that they are not confined to the surface on which they are drawn. They are on the contrary supposed to be projected into so many planes, forming partitions, which divide the cavity into compartments, each containing a certain portion of the abdominal viscera.”

Although not every author as distinctly expresses this idea, it is obvious that the conception of projected planes is entertained by all, for otherwise there would be little point in the artificial subdivision of the surface. As Bell says (fourth American from fourth English edition, New York, 1822): “To give greater accuracy to the description of the seat of the viscera, or, perhaps, rather more strictly to connect the knowledge of the internal parts with the outward marks of the belly,” is the object of the arbitrary drawing of imaginary lines. All authors speak of certain organs as being situated in specific regions, which, of course, could be true only on the supposition of the extension of the lines straight backward to the posterior wall of the abdomen.

The discrepancy in the drawing of the dividing lines between the various regions is very marked, and almost every possible variation, consistent with the general plan which actuates every method, is presented for our adoption. The greater part of the authors seem to make an effort at exactitude, though with a degree of success which is not altogether admirable; while others content themselves with the establishment of the vaguest boundaries. A good example of the latter class is Fyfe (1800), whose description is worthy of extended quotation:

“It (the abdomen) is distinguished into three Divi-

sions or Regions, termed Upper, Middle, and Under Regions; each of which is subdivided into three others.

"The Upper Region begins opposite to the Cartilage Eusiformis, at a small depression called Scrobiculus Cordis, or Pit of the Stomach, and extends to about a hand-breadth from the Umbilicus or Navel.

"The middle of this Region is termed Epigastrium, or upper part of the Belly, and the two lateral parts Hypochondria, from their lying under the Cartilages of the False Ribs.

"The Middle Region occupies an equal distance above and below the Umbilicus. The middle part of it is called the Umbilical, and its lateral parts the Lumbar Regions or Loins.

"The Under Region begins where the middle one terminates, or at a line drawn between the superior anterior Spinous Processes of the Ossa Ilii, and forms in the middle the Hypogastrium, or bottom of the Belly, and at the sides, the Iliac Regions."

In this description there is not the slightest approach to precision; and the only semblance of such approximation occurs in the implication that the level of the anterior superior spinous processes is a hand's breadth below the navel — an idea which needs no comment, whether a "hand" (four inches) is meant, or the actual breadth of hand of the special person who conducts the measurement. The most that we get out of this account is this: the front surface of the belly is to be considered as mapped out into nine regions of indefinite boundaries and widely varying and undetermined areas.

As a type of the class who attempt accuracy, we may take Quain (1882 edition), who draws the two horizontal lines respectively "at the level of the lowest part of the wall of the thorax," and "between the highest points of the iliac crests"; and the lines dividing these vertically "upwards on each side from the middle of Poupart's ligament."

Between these extremes of vagueness and precision are numerous grades of indistinctness. The upper horizontal line is drawn "opposite the cartilages of the ninth rib," "parallel with the cartilages of the ninth ribs," "over the ninth costal cartilages," "between the cartilages of the tenth ribs," between "the most prominent point of the cartilages of the ribs," "from the inferior margins of the ribs," "across the base of the thorax." The lower horizontal line is drawn "on a level with the most prominent part of the crest of the hip bone," "the crista of the ilium," and "between the iliac crests."

The lines dividing the zones are made to pass "from the cartilage of the eighth rib to the centre of Poupart's ligament," "from the spines of the pubis to the cartilages of the eighth ribs," and "from the middle of the groin vertically."

At the first glance I may seem to be in error in speaking of the most of these rules as being vague; but my reason for considering them so will be seen when I call attention to the facts that each of the cartilages mentioned presents so extensive a margin as to permit a variation of five centimetres, more or less, for the choice of the student in selecting a starting-point for his measurement; that the anterior margins of the ribs, as distinguished from their cartilages, are practically impossible of ascertainment through their natural coverings; that the most prominent point of the costal cartilages is not the same in different people; that there is large room for difference of opinion as to what is the most prominent part of the crest of the ilium; and that "groin" is a word of elastic application.

Some authors give exact directions, but differ vastly among themselves.

An influence which augments the confusion of the student's mind in these premises is exerted by the

dictionaries. One says that the epigastrium is "the abdominal wall in front of the stomach," and another, "that part of the abdomen immediately over the stomach and below the diaphragm." One gives the following extraordinary definition of the iliac region: "The side of the abdomen between the ribs and the hips"; and of the umbilical, "That portion of the abdomen two or three inches above, below and on each side of the umbilicus"; and so on, to the great weariness of the spirit.

This dire confusion must suggest the necessity of agreement among anatomical teachers concerning the limits of the regions, which long usage and general consent admit are important. Consequently, I venture to suggest the adoption by this Association, which includes so large a number of the prominent specialists in anatomy in this country, of a system by which these regions may be described uniformly in all of our schools. The influence of our action would be felt abroad, especially if we were to request conference with similar societies in other lands.

The plan which I offer and defend may not meet with your approval; but I trust that some plan will be adopted, as I believe that the credit of modern anatomy requires a radical reform of our present slovenly method.

I propose that the dividing lines be drawn as follows:

The upper horizontal at the level of the lowest point of the inferior margin of the tenth costal cartilage.

The lower horizontal at the level of the anterior superior spinous process of the ilium.

The lines intersecting these from the middle of Poupart's ligament on each side perpendicularly.

In support of this drawing of the upper horizontal, I submit these advantages:

The ease with which the lower margin of the tenth costal cartilage is located.

The perfect definiteness of the directions, which is not attained by mentioning any particular cartilage, without specifying a point upon it.

The anatomical propriety of allowing as large an area as this permits for the upper zone, thus giving a nearer approach to uniformity of width in the three zones.

The fact that this drawing is recommended by some of the ablest authors, such as Bell, Quain and Leidy.

For the lower horizontal line I claim these meritorious points :

Absolute definiteness.

The facility with which the anterior superior spinous process of the ilium is found.

The approximation to uniformity of width of the three zones, which this method ensures.

The localizing of the navel more nearly at the vertical centre of the umbilical region, than is accomplished by having the line pass below the highest points of the iliac crests, as advised by Gray, Quain, Leidy, and others, who thus bring the umbilicus into the lowest part of the region to which it gives the name, and often on the line separating this from the region immediately below.

The fact that this drawing has the support of prominent teachers, like Bell, Owen, Macalister and McClellan.

My arguments for the intersecting lines proposed are as follows :

The middle of Poupart's ligament is easily determined.

The selection of this point is better than that of the bony prominence to which its outer end is attached (as practised by Bell and Cloquet), because we thus cause this line to divide the lowest zone into three regions, as in the case with the upper and middle ; and make it divide the other zones much more equally.

Only a little room is left for the hypochondriac and lumbar regions if the line is drawn perpendicularly from the anterior superior iliac spine.

The choice of this point is also better than that of the osseous process to which the inner end of the ligament is fastened, as advocated by Macalister and McClellan, because, if the line be drawn perpendicularly, the lateral boundaries of the central region of each zone become too close; and, if it be drawn to the cartilage of the eighth rib, as recommended by these writers, it is less definite, because no point on the cartilage is specified, and it is harder to carry abstractly in mind an account of its obliquity. It is worthy of remark in this connection that the difficulty, upon which I have insisted in the matter of the directions which merely mentions a costal cartilage, is strikingly shown in the picture which accompanies the description of the abdominal regions in that splendid and most recent American addition to our anatomical libraries, wherein we find the text and the drawing in disagreement. If a mistake is so readily made by so painstaking an author, who is also his own artist, in a picture which delineates the cartilages in outline, how difficult it must be for an ordinary practitioner, who is not an expert in anatomy, to avoid such errors in the case of a patient whose thoracic framework is "padded round with flesh and fat."

The perpendicularity of the line is an obvious advantage: first, because it is so simple and, therefore, easy to remember; and, second, because it makes rectangles with the lines which it crosses, and thus contributes to uniformity of outline and comfort of memory. It is true that a line thus drawn will not in all cases strike the same point on the thorax — it will be further away from the *linea alba* in women than in men, on account of the relatively wider pelvis and narrower chest in the female sex. But no rule in this

matter will give absolute results, and the one proposed is as free from disadvantages as any other can be.

There is only one point to remember — the middle of Poupart's ligament. Those who name a point on the chest wall for the other end of the line add an element of difficulty to the task of the student, and can be by no means positive that the resulting line will be vertical. It is a method taught by distinguished anatomists, as Quain and Owen; and others, like Ellis and Gray, make the middle of Poupart's ligament one of the two points between which they draw each of these subdividing lines.

It will be observed that each of the component parts of this plan has the sanction of some illustrious authority; but their association does not occur, as far as I know, in the method of any writer.

In this system only three anatomical points require to be remembered — the lowest point of the tenth costal cartilage, the anterior superior iliac spine, and the middle of Poupart's ligament. I think that it will compare favorably with any other method in respect to theoretical simplicity, accuracy and uniformity of results, and practical applicability.

In this connection it is fitting that something be said about the names which are applied to the different regions.

The central region of the upper zone and the region on each side of it are called respectively epigastric and hypochondriac, by universal usage, except when the cognate terms, epigastrium and hypochondrium, are used. The central area in the middle zone is always named umbilical, and its lateral associates lumbar, by an almost equally unvarying custom. In the lowest zone the central region is generally designated hypogastric or the hypogastrium; but certain authors prefer pubic.

The sanction of ancient custom weighs with me in determining my choice of hypogastric, particularly as

it seems to me so desirable to have the word *pubic* reserved for that area which, in the adult, is covered with hair, and includes not only the lower part of the hypogastric region, but also the bodies of the pubic bones and the structures in front of them.

Iliac is most frequently the adjective applied to the side areas in the lowest zone, though *inguinal* is preferred by some writers. My choice is the former, inasmuch as a part of the region is not groin, and all of it is neighboring to the hip-bone. *Inguinal* may well be applied to the long, obliquely situated area, which is located partly above and partly below Poupart's ligament—is, as it were, threaded upon the ligament—and is as much a portion of the thigh as of the abdomen.

In conclusion, a few words may appropriately be spoken in answer to an anticipated objection to this plea for uniformity and accuracy in the delimitation of the abdominal regions.

It has thus far been assumed that the mapping out of regions by imaginary lines is desirable; but I have heard it said that this is useless, because the contents of the designated regions are not the same in all cases.

Considerable variation is admitted; but it is probably not greater than obtains in many other cases in which the desirability of artificial aids to precision is universally admitted. In anatomy we do not look for mathematical accuracy and absolute uniformity, but only for approximations. Our rules are based upon the usual, not upon the invariable. And there seems to me to be no good reason why some uniform method of division of the abdominal surface may not be agreed upon by the anatomical world, which shall be of essential service in the direction of simplification and precision in the description of the relation of the viscera to the parietes and to each other.

28.

DELIMITATION OF ABDOMINAL REGIONS.¹

BY E. A. BALLOCH, A.M., M.D.,

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PROFESSOR ANDERSON'S communication to the Anatomical Society of Great Britain, in May last, pleading for uniformity in the delimitations of the regions of the abdomen, draws attention to a matter which is of considerable importance to practical anatomists.

As he clearly shows, there is a complete lack of uniformity among anatomists, both as to the boundaries and contents of the region thus artificially outlined. The starting points from which the lines are drawn are likely to vary in position, and no less than fourteen different subdivisions have been made.

Professor Anderson rightly characterizes this confusion as "chaos."

The question is: Can we simplify this subject and agree upon a subdivision acceptable to all?

I take it that our purpose, as teachers, is to adapt anatomy to the daily needs of the practitioner. Now, as a matter of fact, it is my observation that in anatomy, as applied to daily practice, these artificial subdivisions are seldom used.

In treating abdominal diseases or injuries, the practitioner will, in most cases, refer to the umbilicus and the median line of the abdomen as starting points, and designate the lesion with reference to these landmarks. References need only be made to tumors of the pylorus, aneurisms of the abdominal aorta, McBurney's

¹ Read before the Association of American Anatomists, December, 1892.

tender point, the incisions for abdominal section, etc. This being the fact, we, as anatomists, should seek to make our artificial divisions of the abdomen conform to the needs of the practitioner as demonstrated by his daily routine.

It must be apparent to all, that the first thing to do is to simplify the division of this region as to number. Nine subdivisions are too many, and this refinement of subdivisions is not needed by those for whose benefit it was presumably made.

Secondly, the boundaries of the subdivisions must be fixed points or, at least, such as are not subject to any great variation in position. Lastly, the subdivisions should be made to conform to the daily needs of the practitioner.

Ophthalmologists have for many years divided the surface of the cornea into quadrants, and lesions in this locality are referred to the upper or lower, outer or inner quadrant, as the case may be, and such reference is perfectly understood by all. So far as I have observed, this plan works well. I see no reason why some such simple subdivision of the abdomen cannot be made.

A line from the symphysis pubis to the ensiform appendix would answer for a vertical, while the horizontal plane could be made at the umbilicus.

The boundaries of these spaces can be outlined with almost equal exactness on the dorsum, where the vertebral column marks the vertical plane, while the horizontal would fall between the third and fourth lumbar vertebræ.

This would give four regions whose boundaries would be reasonably well fixed and not subject to any marked variation. They could be designated as upper and lower, right and left quadrants; and this plan would be an improvement on the present methods of subdivision.

It might be objected to such a division that the vertical plane would bisect the stomach, bladder and uterus, and throw part of these organs into one quadrant and part into another. As to the stomach, this objection lies equally against the present subdivision. As to the bladder and uterus, they are really more pelvic than abdominal viscera, and I think the objection would hardly have much weight from a practical standpoint.

The British Society appointed a committee to consider this matter, with a view to arriving at a uniform plan of delimitation of the regions of the abdomen.

I think we might properly co-operate with this committee, as the question is one equally important to us and to them.

DISCUSSION.

DR. THOMAS DWIGHT, of the Harvard Medical School, said that he was inclined to agree with Dr. Balloch rather than with Dr. Gerrish. While he thought the latter's method of dividing the abdomen the best that he knew, it was by no means perfect. The lowest part of the cartilage of the tenth rib cannot in all cases be certainly recognized, nor is it always in the same place. The position of the lines must be influenced by sexual and individual peculiarities, to say nothing of the effect of various degrees of distention of the abdomen. It is needless to say that the regions of the abdomen have no morphological significance, and in surgical practice the situation of a tumor is usually described by means of measurements from fixed points. He is in the habit of teaching that it is convenient to retain the customary names of these regions, but that it should be recognized that they are to be used vaguely, and that it is useless to pretend to define by sharp lines where one region ends and another begins.

DR. GEO. A. PIERSOL, University of Pennsylvania : While appreciating fully the force of Dr. Dwight's remarks, yet the fact remains that the nine conventional divisions will continue to find place in our text-books. It is, therefore, very desirable that uniformity in the arbitrary boundaries adopted should prevail. The lines advocated by Dr. Gerrish offer the advantage of being largely determined by accessible skeletal points. Almost identical boundaries have been adopted by Joessel, who, however, assumes as the vertical lines perpendiculars erected from the ilio-pectineal eminences.

DR. CARL HEITZMANN, New York City: It seems to me that we will never come to an agreement in an open meeting, the more so, since the views held by German anatomists have entirely been neglected. Some take the nipples as starting points, joining the spinæ ilii anteriores. The best division seems to me that adopted by Hyrtl and others. He starts from the sterno-clavicular articulations, sending lines to the spinæ ilii anteriores. Then he joins transversely the lowest borders of the tenth ribs and both spinæ ilii; the region outlined by the lower borders of the ribs and the processus zyphoideus on the one hand, and the transverse line between the tenth ribs, he terms *epigastrium*; the region between the two transverse lines (tenth ribs and both spinæ ilii), he terms *mesogastrium*; and that between the transverse line uniting both spinæ and the upper border of the iliac bones, *hypogastrium*. The mesogastrium is subdivided by a horizontal line starting from the navel into a regio supra-umbilicalis and a regio infra-umbilicalis; the hypogastrium, by a vertical line into the mesial regio pubis and the lateral regio inguinalis. In my judgment, the papers should be referred to the Committee on Nomenclature, which, in due time, may report to the Association for final decision.

DR. D. S. LAMB, Army Medical Museum, Washington: I am inclined to favor the proposition of Dr. Balloch, to divide the abdomen into quadrants by a median sagittal plane and a horizontal umbilical plane. I do not see how any careful person can make a mistake concerning these planes. They are uniform for all subjects; assuming, as I do, that the position of the umbilicus, for all clinical purposes, is sufficiently uniform in its relations to neighboring parts. Besides the horizontal plane it corresponds very closely to the uppermost level of the iliac crest, the body of the fourth lumbar vertebræ and the aortic bifurcation.

The only important viscera below this plane are the intestines and pelvic organs. The position of a point stated to be three inches to the right of the median line and three inches above the umbilical line in an adult, lying on his back, would be understood by every one, and be easily marked on a chart or on the body of another subject. If anatomists would state, for instance, that the pylorus is found on the average to be so far above and so far to the right of these respective lines, there would be no doubt in the mind of the reader as to the precise place indicated.